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THE HIGHER CLASSIFICATION OF THE ALYDIDAE (HEMIPTERA: HETEROPTERA)

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Abstract.—Characters are taken from the literature and their derived states determined. The following higher classification of the Alydidae best agrees with the data: family Alydidae; subfamilies Alydinae and Micrelytrinae, the Alydinae with tribes Alydini and Daclerini; the Micrelytrinae with tribes Micrelytrini and Leptocorisini; the latter with subtribes Leptocorisidi and Noliphidi.

Key Words: Alydidae, higher classification, Leptocorisini, Micrelytrinae, Noliphini, Daclerini

Until 1965 the family Alydidae had been variously treated as a subfamily of Coreidae, or as a family in its own right. However, when treated as a family the habit of subfamilial treatment persisted, and the lower categories were considered tribes, not subfamilies (see Schaefer [1965] for the taxonomic history). In 1965 I presented evidence for family rank of the group, and recognized two subfamilies, Alydinae and Micrelytrinae, the latter with two tribes, Micrelytrini and Leptocorisini.

In the same year, Ahmad (1965) published his revision of *Leptocorisa* and its relatives. He treated this group as a subfamily, of status equal to Alydinae (*sensu mihi*) and Micrelytrinae (Micrelytrini *mei*). He discussed these three subfamilies very briefly, but did not give arguments for treating them as of equal rank. Ahmad and I had not seen each other's papers, and therefore neither of us could consider the higher-rank treatment of the other.

Since 1965, Ahmad's view has prevailed, with a lapse in 1979, when Ahmad et al. (1979) treated Leptocorisini and Micrelytrini as tribes in the subfamily Leptocorisinae. Nevertheless, most post-1965 authors treated the three groups as subfamilies, perhaps because Ahmad's (1965) study of the Leptocorisinae (*sensu suo*) was more detailed than mine of the entire Alydidae. Indeed, I myself subsequently treated the three groups as subfamilies (see, for example, Schaefer 1972, 1980, Schaefer et al. 1989, but see Schaefer 1996); most notably, the three subfamilies are recognized in the catalog of Nearctic Heteroptera (Froeschner 1988). (Note: the change by Henry and Froeschner [1992] from Leptocorisinae to Leptocorinae is surely incorrect: the generic name is *Leptocorisa*, not *Leptocoris* [which is a genus in Rhopalidae].)

In 1993, Li and Zheng published a study of alydid phylogeny. In it they concluded "that Schaefer's (1965) division of this family into two subfamilies—Alydinae and Micrelytrinae—is reasonable." Their "cladograms do not support Ahmad's (1965) and some other authors' contention that the Alydidae be divided into three subfamilies—Alydinae, Leptocorisinae, and Micrelytrinae" (quoted from the English abstract of Li and Zheng [1993]). Since the

appearance of this paper, Prof. Zheng has most generously provided me with an English translation of it.

Li and Zheng (1993) discuss and illustrate many characters in some detail, thus adding substantially to the already rich literature on Alydidae (see references in Table 1). Accordingly, I have extracted characters from this literature and have attempted to determine their derived states, in an attempt to establish better the Alydidae's higher classification.

Methods

I extracted from the literature on the Alydidae characters whose states could be tabulated and whose polarities for the most part could be determined. All these characters are ones important in the higher systematics of Coreoidea and, indeed, of Pentatomomorpha (the heteropteran infraorder to which Coreoidea belongs; see Henry 1997). Sample size is of course a problem; all genera and many species of Alydinae are described in Schaffner's dissertation (1964), but only for the Leptocorisini are all members of the group treated and their morphology described, in Ahmad's (1965) monograph. In particular, the Micrelytrini need revision, with attention given to morphological features of systematic importance in other alydids.

In polarizing the character states I take the Coreidae as the outgroup. Henry (1997) presents convincing evidence that this family is the sibling group of Alydidae. Other arguments for my polarizing occur in the references and in footnotes to Table 1.

Results and Discussion

Twenty-eight characters and their states are in Table 1 (where I anticipate my conclusions by treating Micrelytrini and Leptocorisini as tribes and Alydinae as a subfamily). Of these characters, I polarized 23; three of the remainder I could not polarize (Distribution, Host plants, Rostral segments); one (Scent gland auricle) is ambiguous; and it is not clear to me if bifid (Micrelytrini) and trifid (Leptocorisini) medial projections of the genital capsule are separate advances over the (primitive) alydine condition, or whether the trifid condition is a further advance over the bifid (in which case, this character would group Micrelytrini and Leptocorisini together).

Thirteen of the characters are autapomorphies of one of the three groups. These autapomorphies are not the only ones defining these groups, of course, because I was not seeking autapomorphies in the literature. Nevertheless, the fact that Alydinae has eight autapomorphies, and the other two groups have fewer (Micrelytrini: 4; Leptocorisini: 1), supports the subfamily status of Alydinae.

Within the Alydinae, Ahmad et al. (1979) created a tribe, Daclerini, for the published genus *Daclera* and for another, unpublished genus. Although they present the new tribe as "MS," it is briefly described in their key and therefore appears to be valid. I have not seen specimens either of *Daclera* or of the undescribed genus. However, Li and Zheng (1993) write that *Daclera* has many apomorphies not shared with other Alydinae. Therefore I treat Daclerini as a tribe in Alydinae, pending further study.

Within the subfamily Micrelytrinae, Micrelytrini and Leptocorisini share six apomorphies (seven, if the median projection condition is synapomorphic; see above), more than either group shares with Alydinae (Micrelytrini and Alydinae: 2; Leptocorisini and Alydinae: 2). Three of these four synapomorphies shared by Alydinae and either Micrelytrini or Leptocorisini are head characters. The states of these characters vary considerably in the Coreoidea (Schaefer 1965), and their common possession in Alydinae and one of the other tribes may therefore be homoplasious. If one accepts that eight autapomorphies is a reasonable argument for subfamily status for Alydinae, then six synapomorphies should support subfamily status for Micrelytrini plus Leptocorisini. Moreover, four of these six synapomorphies are characters of the

Table 1. Differences and similarities among Micrelytrini, Leptocorisini, and Alydinae. Apomorphic states in **boldface**.

	Micrelytrini	Leptocorisini	Alydinae	Reference
Distribution	tropical, subtropical	tropical, subtropical	tropical, subtropical; some temperate	Schaffner 1964, Ahmad 1965
Host plants	Graminae (?)	Graminae	Leguminosae	Schaefer 1979
Head				
Midcephalic sulcus	**deep**	**deep**	shallow or absent	Li and Zheng 1993
Head constricted basally	**yes**	rarely	**yes**	Li and Zheng 1993
Head with "collar"	no	**yes**	**yes**	Schaefer 1965
Ocelli on tubercle	**yes**	rarely	**yes**	Li and Zheng 1993
Paraclypei well developed	sometimes	**yes**	no	Li and Zheng 1993, Ahmad 1965
Rostral segments	2 > 3 + 4; 4 = twice 3	2 < 3 + 4; 4 = 3	2 < 3 + 4; 4 > 3, rarely twice 3	Ahmad 1965, Schaefer, unpubl.
Thorax				
Hind femur	not armed	not armed	**spined or with stiff setae**[a]	Schaffner 1964, Ahmad 1965
Hind tibia	straight, untoothed	straight, untoothed	**usually curved and with ventral tooth**[a]	Schaffner 1964, Li and Zheng 1993
Forewing media	**coriaceous basally in membrane**	**coriaceous basally in membrane**	not coriaceous	Li and Zheng 1993
Forewing costa	not fused to radius and media	not fused to radius and media	fused[b]	Schaefer 1965, Li and Zheng 1993
Scent gland peritreme: lateral and anterior auricles fused	variable (no: Schaefer 1965; yes: Li and Zheng 1993)	no	yes	Schaefer 1965, Li and Zheng 1993
Abdomen				
Trichobothria (5th sternum)	in a triangle	in a triangle	**in a line**[c]	Schaefer 1965, 1975
Male genital capsule[d]				
Ventral rim	**with spine**	without spine[e]	without spine	Schaefer 1980
External opening	posterior	**dorsal**	**dorsal or posterodorsal**	Schaefer 1980
Dorsal wall	sclerotized	sclerotized	**membranous**	Schaefer 1980, Schaefer et al. 1989
Median projection	**bifid**	**trifid**	single	Schaefer 1980, Schaefer et al. 1989
Cuplike sclerite with lateral projections	no	no	yes	Schaefer et al. 1989
Segment 10	**sclerotized dorsally**	**sclerotized dorsally**	membranous dorsally	Schaefer 1980
Paramere	apex not tuberculate	apex not tuberculate	**apex tuberculate**	Ahmad 1965, Li and Zheng 1993

Table 1. Continued.

	Micrelytrini	Leptocorisini	Alydinae	Reference
Male aedeagus				
Vesica	**not slender, coiled**[f]	**not slender, coiled**[f]	**slender, straight**[f]	Schaefer 1965, Ahmad 1965, Li and Zheng 1993
Conjunctiva	**laterally with pair of asymmetrical appendages**	**laterally with pair of asymmetrical appendages**	without these appendages	Schaefer 1965, Ahmad 1965, Li and Zheng 1993
Phallosoma	**dorsally with pair of apically directed appendages**	**dorsally with pair of apically directed appendages**	without these appendages	Schaefer 1965, Ahmad 1965, Li and Zheng 1993
Female genitalia				
9th paratergite	**divided**	not divided	not divided	Schaefer 1965
2nd valvula	**partly membranous**	sclerotized	sclerotized	Schaefer 1965
Ring sclerites	1 pair	**2 pairs**	1 pair	Schaefer 1965
Ring-sclerite sacs	**1 median sac**	1 pair[g]	1 pair	Schaefer 1965

[a] Curved and armed femora and tibia are uncommon in Coreoidea (except some Meropachydinae and some male Coreinae).

[b] Fusion of wing veins appears *ipso facto* to be more advanced than nonfusion.

[c] The posterior abdominal trichobothria in Coreoidea are usually in a triangle (except Rhopalidae) (Schaefer 1975).

[d] These features vary independently of one another (Schaefer 1980), and therefore may be treated as separate characters.

[e] Spine is present in at least one leptocorisine (discussion in Schaefer 1980, p. 126).

[f] According to Li and Zheng (1993), the apomorphic state of Alydinae differs from the apomorphic state of Micrelytrinae.

[g] Ahmad (1965) writes that Leptocorisini have 0–4 pairs of "intervalvular sclerites"; I believe these are not the same as the sacs associated with the ring sclerites.

male genitalia, a character complex always useful in heteropteran higher classification; common possession here is unlikely to be homoplasious In addition, other characters support the uniting of these two groups as a subfamily; these characters and the arguments based upon them, are not easily tabulated: see Schaefer (1965).

Li and Zheng (1993) comment upon the antlike fascies of Alydinae, treating it as an autapomorphy of the group. It is true that immature alydines are antlike, but so are the adults of several Micrelytrini. In fact, there are two groups of Micrelytrini, one of somewhat or quite elongate insects, and the other of smaller often antlike insects (Schaefer 1996). Members of both groups occur in both the New and Old World tropics. By chance, Li and Zheng (1993) took as their representatives of Micrelytrini *Marcius* and *Paramarcius,* both members of the somewhat elongate (and nonantlike) group.

Of great interest would be a study of the phylogenetic relationships among these four groups (New World and Old World antlike and elongate micrelytrines), between the antlike micrelytrines and the Alydinae (whose nymphs are antlike), and between the elongate micrelytrines and the Leptocorisini (most of whose genera are Old World tropical; the Noliphidi are somewhat elongate and the Leptocorisidi are very elongate). I discussed some of these relationships earlier (Schaefer 1972).

Classification

As a result of this work, I suggest the following classification, in which the tribes of Ahmad's (1965) Leptocorisinae are reduced to subtribes.

Family Alydidae Amyot et Serville 1843
Subfamily Alydinae Amyot et Serville 1843
Tribe Alydini
Tribe Daclerini
Subfamily Micrelytrinae Stål 1867
Tribe Micrelytrini Stål 1867
Tribe Leptocorisini Stål 1870
Subtribe Leptocorisidi Stål 1870
Subtribe Noliphidi Ahmad 1965

Note: Based on their cladistic analysis, Li and Zheng (1993) suggest that *Acestra,* a genus placed uneasily in the Micrelytrini (see discussion in Li and Zheng [1993]), be removed from Micrelytrini and raised to tribal rank in the Micrelytrinae; they do not do this formally. Also, as I mentioned above, Li and Zheng (1993) found autapomorphies in *Daclera,* the only described genus now in Daclerini. These two genera should be studied more closely, as should the Micrelytrini as a whole.

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